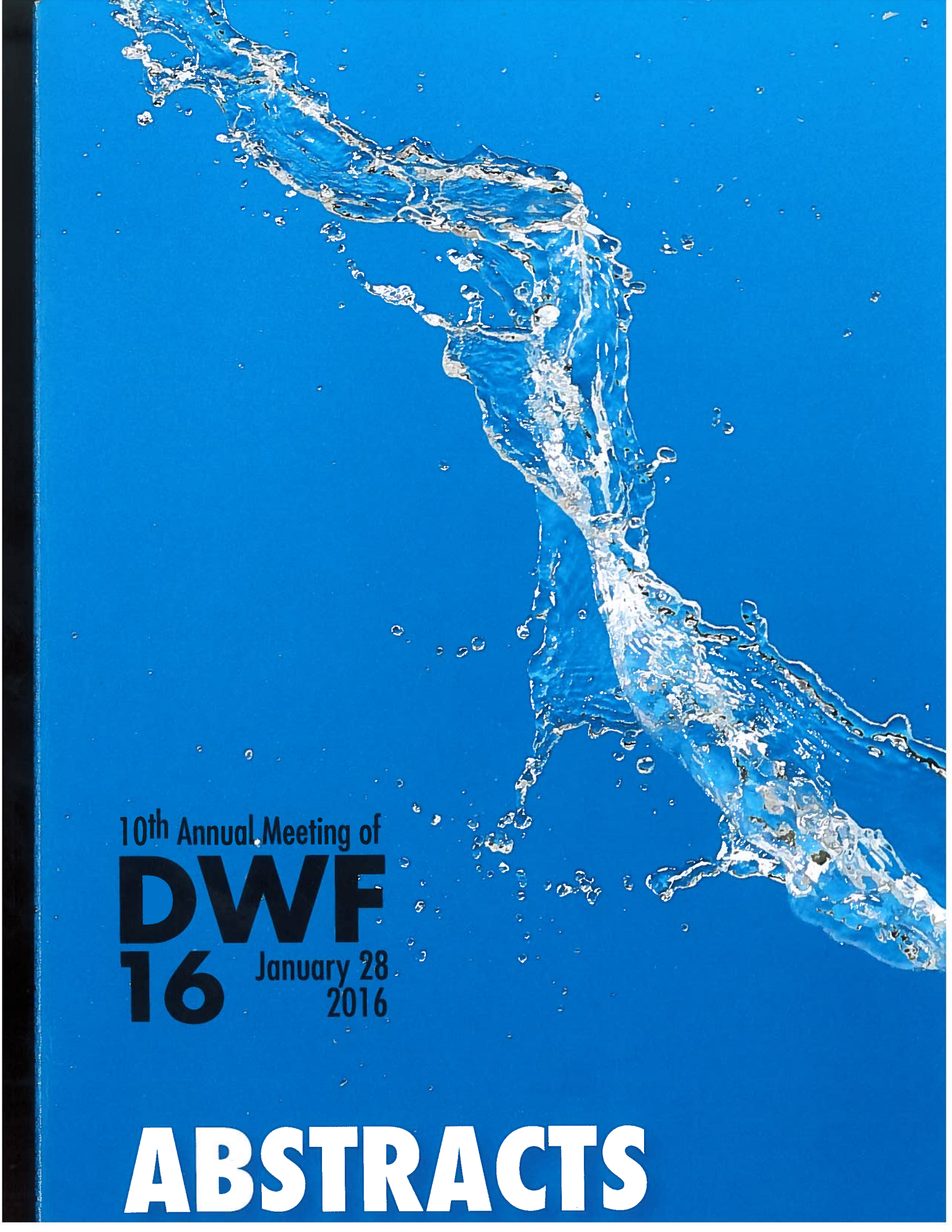
Environmental life cycle assessment of urban storm water management

Brudler, Sarah; Arnbjerg-Nielsen, Karsten; Rygaard, Martin

Published in:
10th annual meeting of DWF16

Publication date:
2016

Document Version
Publisher's PDF, also known as Version of record



10th Annual Meeting of

DWF 16

January 28
2016

ABSTRACTS

Environmental life cycle assessment of urban storm water management

S. Brudler, DTU & VCS Denmark**; K. Arnbjerg-Nielsen & M. Rygaard, DTU**

Abstract

The environmental impacts of cloudburst management systems are assessed using Life Cycle Assessment (LCA). A terrestrial LCA approach as introduced by Loiseau et al. (2013) is first used in connection to storm water management (SWM) and tested using two different climate change adaptation strategies for a catchment in Nørrebro, Copenhagen. The catchment area is defined as the reference flow, from which different functions are derived based on the Three Points Approach, which divides rain events in different domains according to frequency (Sørup et al., 2012). This allows defining different safety targets for everyday and rare rain events, which are met by a combination of different elements that differ in the two scenarios. The "green" scenario mainly utilizes green infrastructure, local retention and infiltration, while the second "grey" solution employs underground pipes and retention basins. The environmental impacts resulting from implementing, operating and decommissioning are significantly smaller for the "green" scenario in all eight considered categories (51% down to 13% of the "grey" impacts). The main contributor in both scenarios is the generation of materials, e.g. concrete and steel, which highlights the possibility for system design optimization in order to reduce negative effects. The allocation of impacts shows that different functions of urban SWM systems affect the environment to a different extent, and that a significant share of impacts are caused by processes not directly linked to handling storm water.

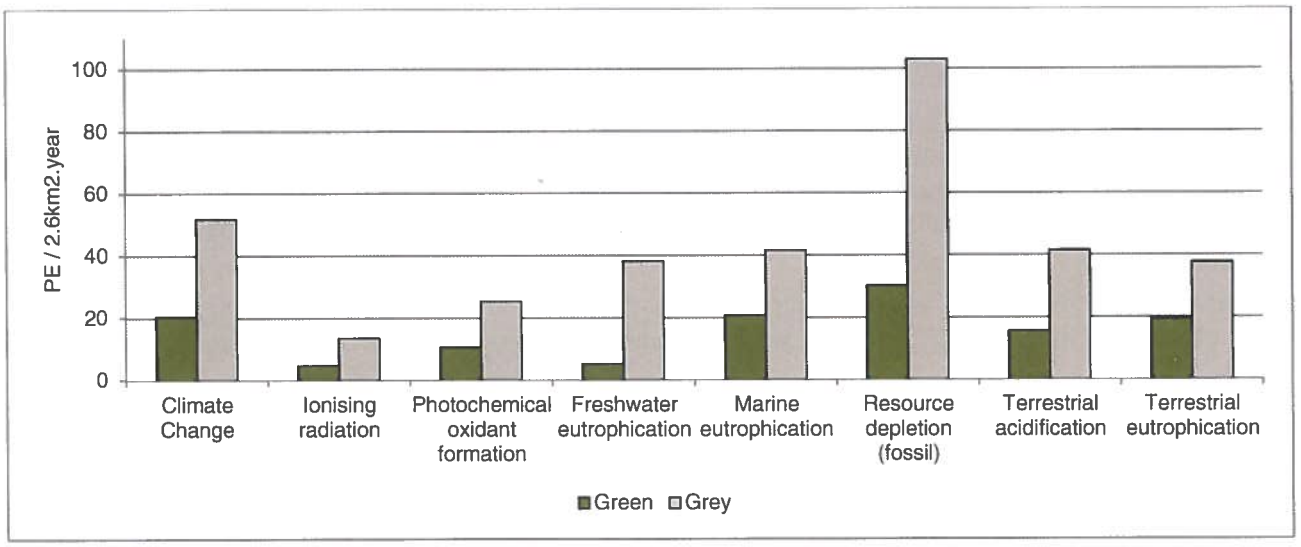


Figure 1 Normalized environmental impacts per year of the two scenarios, for eight selected midpoint categories

References:

Loiseau, E., Roux, P., Junqua, G., Maurel, P., Bellon-Maurel, V., 2013. Adapting the LCA framework to environmental assessment in land planning. Int. J. Life Cycle Assess. 18, 1533–1548.

Sørup, H.J.D., Arnbjerg-Nielsen, K., Mikkelsen, P.S., Rygaard, M., 2012. Quantitative potential for rainwater use. Technical University of Denmark, Dept. of Environmental Engineering, Lyngby, Denmark.

* *sabr@env.dtu.dk, karn@env.dtu.dk, mryg@env.dtu.dk: Dept. of Environmental Engineering, Bygningstorvet, Bldg. 115, 2800 Kgs. Lyngby, Denmark*

** *Vandværksvej 7, 5000 Odense C, Denmark*